

# **LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES**



**OFFICE OF FISHERIES  
INLAND FISHERIES SECTION**

**PART VI -B**

**WATERBODY MANAGEMENT PLAN SERIES**

**LAKE PROVIDENCE**

**WATERBODY EVALUATION &  
RECOMMENDATIONS**

# **CHRONOLOGY**

DOCUMENT SCHEDULED TO BE UPDATED ANNUALLY

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# WATERBODY EVALUATION

## STRATEGY STATEMENT

### Recreational

Sportfish species are managed to provide a sustainable population while providing anglers the opportunity to catch or harvest numbers of fish adequate to maintain angler interest and efforts.

### Commercial

Species comprising a commercial fishery exist in Lake Providence with commercial fishing being permitted during a special winter season.

### Species of Special Concern

No threatened or endangered fish species are found in this waterbody.

## EXISTING HARVEST REGULATIONS

### Recreational

Statewide regulations are in effect for all fish species.

### Commercial

In March 1992, legislation was passed that prohibits the use of gill and trammel nets in Lake Providence except during a special recurring trammel and gill netting season to commence each year at sunrise on November 1 and close at sunset on the last day of February the following year. The trammel and gill nets allowed during the special recurring season shall have a minimum mesh size of three and one-half inch bar and seven inch stretched. Nets may remain set overnight, but fish captured must be removed during daylight hours only.

## SPECIES EVALUATION

### Recreational

Largemouth bass (*Micropterus salmoides*) are targeted for evaluation since they are a species indicative of the overall fish population due to their high position in the food chain and because they are highly sought after by anglers. Electrofishing is the best indicator of largemouth bass abundance and size distribution, with the exception of large fish. Sampling with gill nets determines the status of large bass and other large fish species.

### *Largemouth Bass-*

#### Largemouth Bass Catch per Unit Effort (CPUE) and Length Frequency

In the chart below (Figure 1), spring electrofishing results are used as an indicator of relative abundance over time with total CPUE (bass per hour) indicated for three size

categories of largemouth bass from 1993 - 2009. There appears to be an upward trend for stock-size (8" – 12") bass and a slightly declining trend for preferred-size (15" – 20") bass. The CPUE for quality-size (12" - 15") bass shows some year-to-year variability, though no long term trend is obvious. Figure 2 depicts CPUE for each length group from the most recent spring and fall electrofishing samples conducted in 2009. The size classes appear to be normally distributed, with mid-size fish being the most abundant and nearly all length groups up to 19 inches being represented. It should be noted that larger bass (> 20 inches) are not efficiently sampled by electrofishing and may be under represented in these results.

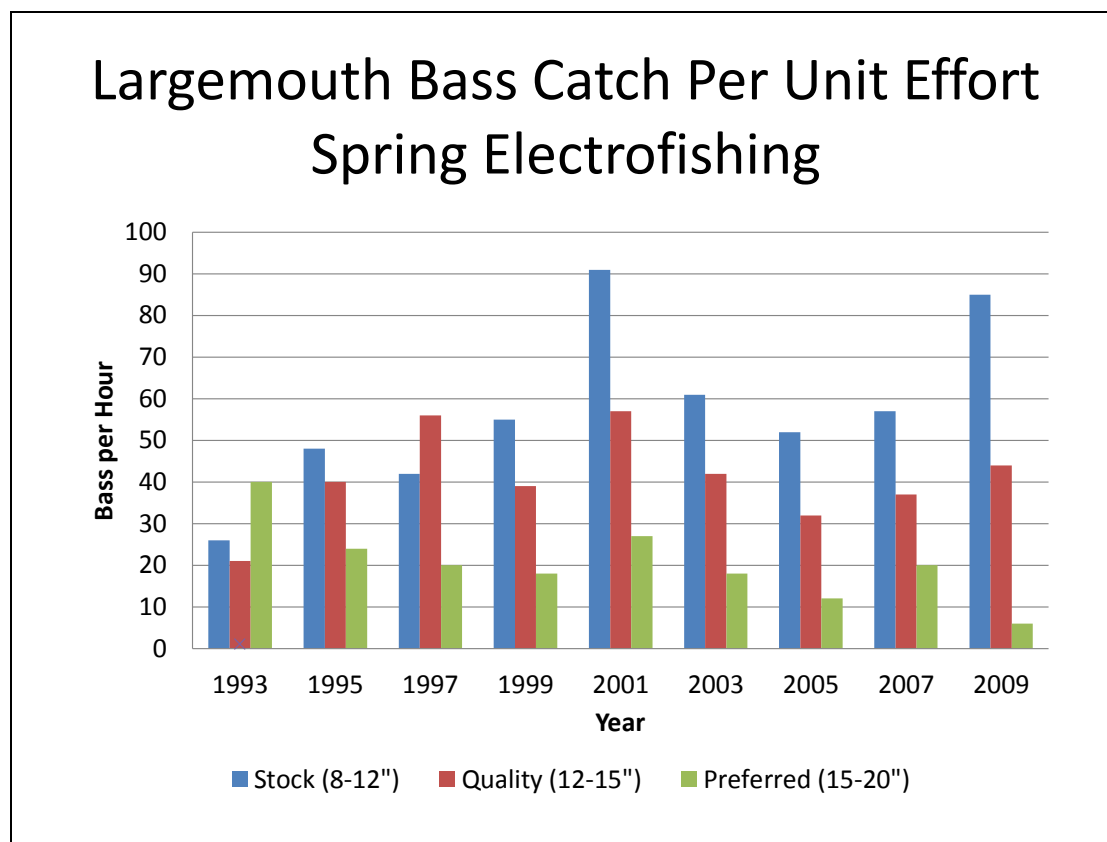


Figure 1. Mean catch-per-unit-effort (bass per hour) for stock-, quality-, and preferred-size largemouth bass collected in spring electrofishing samples on Lake Providence, LA from 1993 – 2009.

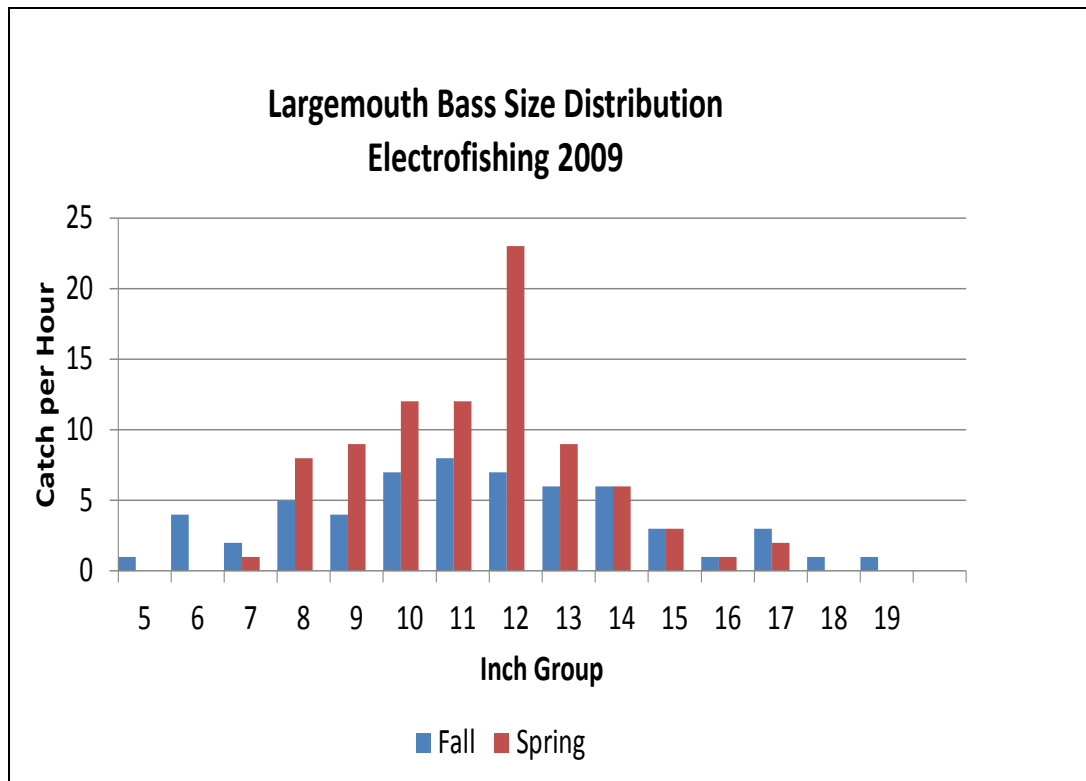


Figure 2. Largemouth bass size distribution by length group (bass per hour) from spring and fall electrofishing results on Lake Providence, LA, for 2009.

#### Largemouth Bass Relative Weight

Relative weight (Wr) for each inch group is shown in Figure 3. This measurement is obtained from fall samples only and is defined as the ratio of a fish's weight to the weight of a "standard" fish of the same length. The Wr index is calculated by dividing the weight of a fish by the standard weight for its length, and multiplying the quotient by 100. Largemouth bass relative weights below 80 may indicate a problem of insufficient or unavailable forage, whereas relative weights closer to 100 indicate sufficient available forage. A description of the forage species and sampling methods is described below. Relative weights for each of the four size classes are greater than 95%, indicating that there is an adequate forage supply for the largemouth bass in Lake Providence.

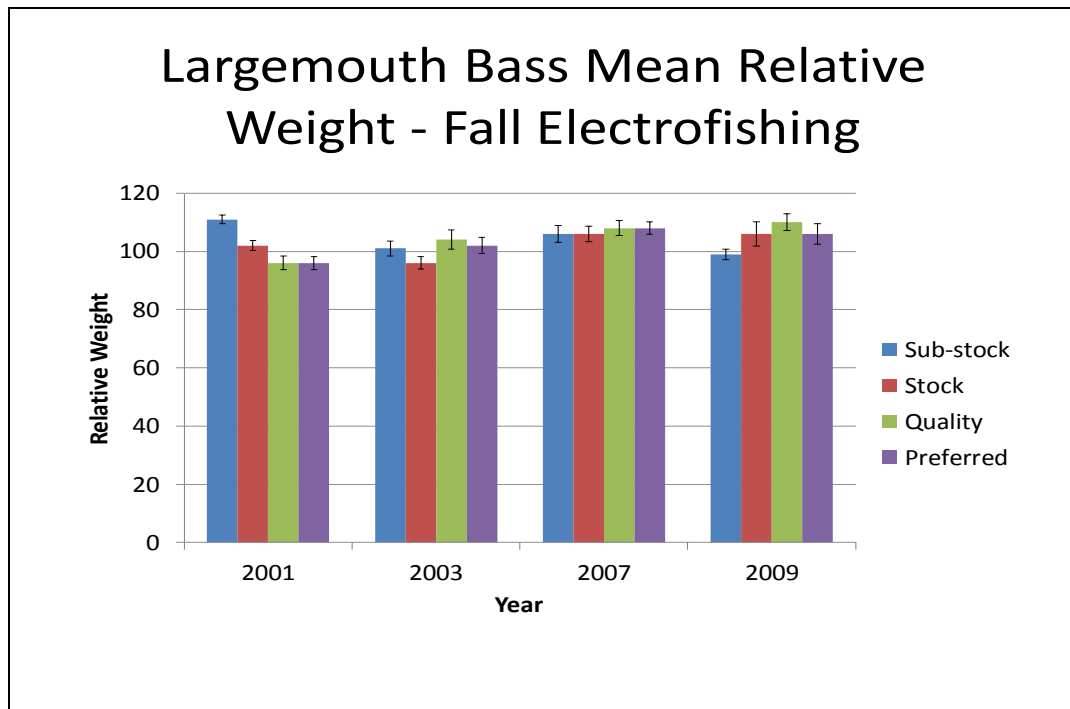


Figure 3. Mean relative weights ( $\pm$  SE) for largemouth bass collected from Lake Providence, LA from fall electrofishing samples in 2001, 2003, 2007, and 2009.

#### Largemouth Bass Genetics

Only the Florida largemouth bass *M. floridanus* (recently recognized as a distinct species) has been stocked into Lake Providence, with the exception of a single stocking of northern largemouth bass in 1975. Florida bass are typically stocked into suitable waterbodies to improve the overall size potential of the bass fishery. Annual stocking was initiated in 2000 and discontinued after 2007. There was one previous stocking in 1987. No genetic analysis was performed before this period, but it was assumed that the population was comprised of only northern largemouth bass. No genetic samples have been taken since 1999, thus the success of these stockings (measured by the percent of the Florida genome found in the sample) is not known. However, the 1999 sample did reveal the presence of the Florida genome in the population (Figure 4). Thirteen percent of the fish in the sample (n= 63) contained Florida genes.

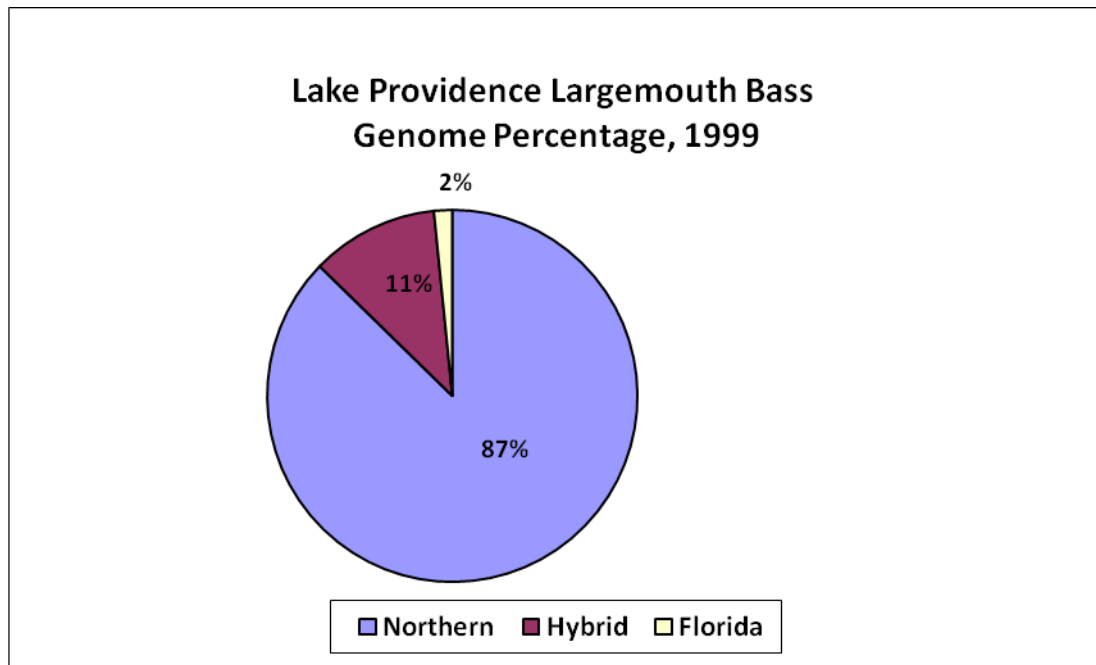


Figure 4. Genetic composition of Lake Providence, LA largemouth bass from a 1999 fall electrofishing sample, n=63.

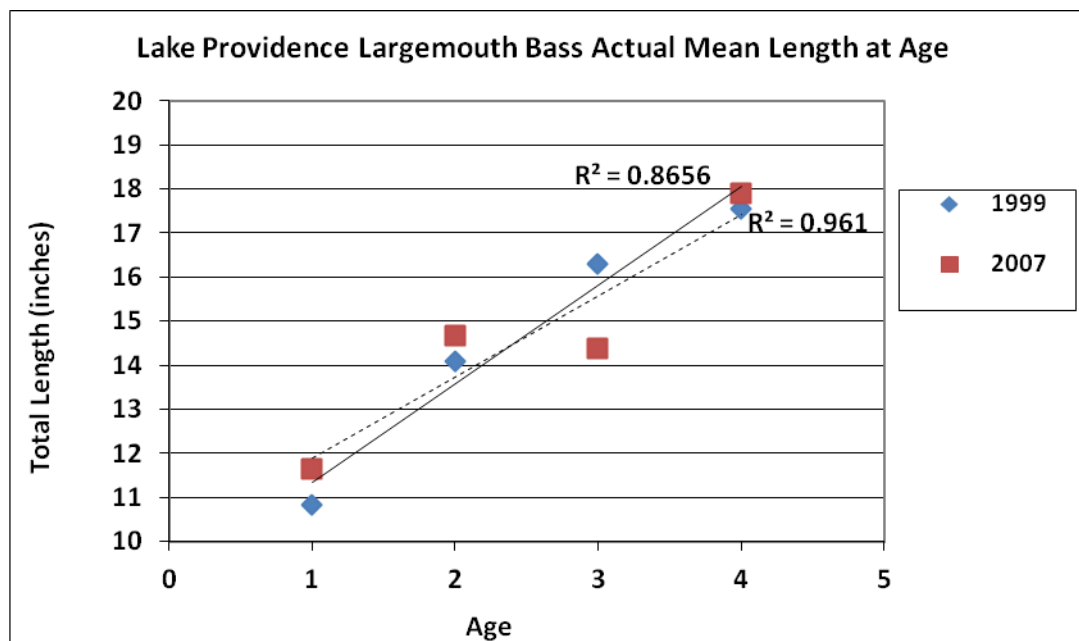


Figure 5. Actual mean length at age for largemouth bass at time of capture.

Fish were collected in fall electrofishing samples from Lake Providence, LA in 1999 and 2007. Trend lines are linear regressions of the relationship between age and total length at capture. The dashed line is the 1999 sample, and the solid line is the 2007 sample. Coefficients of determination ( $R^2$ -values) indicate the strength of the relationship, where 0 is no relationship and 1.0 is a perfect linear relationship.



### Largemouth Bass Age and Growth

Age was determined for largemouth bass from fall electrofishing samples in 1999 and 2007. Lengths (mm) for ages 1+ to 4+ are shown in Figure 5. Lake Providence largemouth bass growth has mostly been above the estimated statewide average (age 1+ = 262mm, age 2+ = 335mm, age 3+ = 384mm, age 4+ = 424mm). Small sample sizes for age 3+ and 4+ fish have probably reduced the accuracy of the mean length estimates for these age classes. Based on the trend lines for each sample (Figure 5), there appears to be no difference in growth rates between the 1999 and 2007 samples.

### *Crappie-*

Crappies (*Pomoxis spp.*) were targeted for sampling in fall 2007 with the use of lead nets. Prior to this, crappies had been collected by electrofishing, gill nets, and biomass samples. These samples are not considered to be reliable estimators of the crappie population due to low sample size. Lead net samples were taken at six station locations throughout the lake in 2007. Both species, white (*P. annularis*) and black (*P. nigromaculatus*) were collected, though black crappie comprised 94% of the sample ( $n = 47$ ). Catch per hour of all crappie captured for each length group is shown in Figure 6. This sample and previous/subsequent others, taken by various gear types, revealed that crappie do not appear to be in great abundance on Lake Providence.

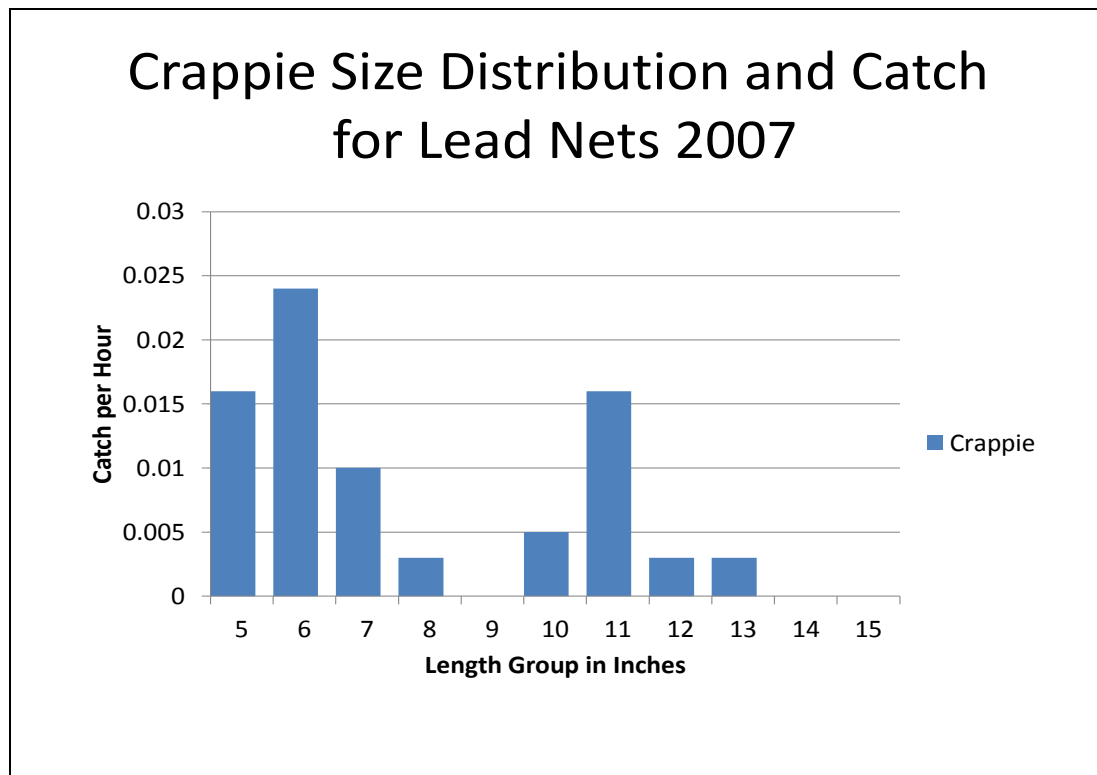


Figure 6. Catch per unit of effort by length group for crappies from fall lead net samples taken on Lake Providence, LA for 2007.

### Sunfish-

Sunfish provide a very popular fishery for anglers at Lake Providence, as there is an abundance of medium and large size fish. Sunfish (bream), as referred to here, are the members of the family Centrarchidae other than black bass and crappie. Bluegill (*Lepomis macrochirus*) and longear sunfish (*L. megalotis*) are the most abundant sunfish species in Lake Providence and comprised 81% and 17%, respectively, of the sunfish captured during 2007 lead net sampling (Figure 7). Mean catch per hour for sunfish in lead nets was calculated to be 0.83 fish/hr. Redear sunfish (*L. microlophus*) are also common. Other sunfish species identified from previous samples include green sunfish (*L. cyanellus*), orangespotted sunfish (*L. humilis*), warmouth (*L. gulosus*) and various sunfish hybrids. Sunfish biomass (in pounds per acre) has been estimated by rotenone sampling from the 1950's thru 1994. Biomass samples taken from 1980 – 1994 ( $n=9$ ) produced a mean estimate of 80.7 lbs. sunfish/acre (Figure 8).

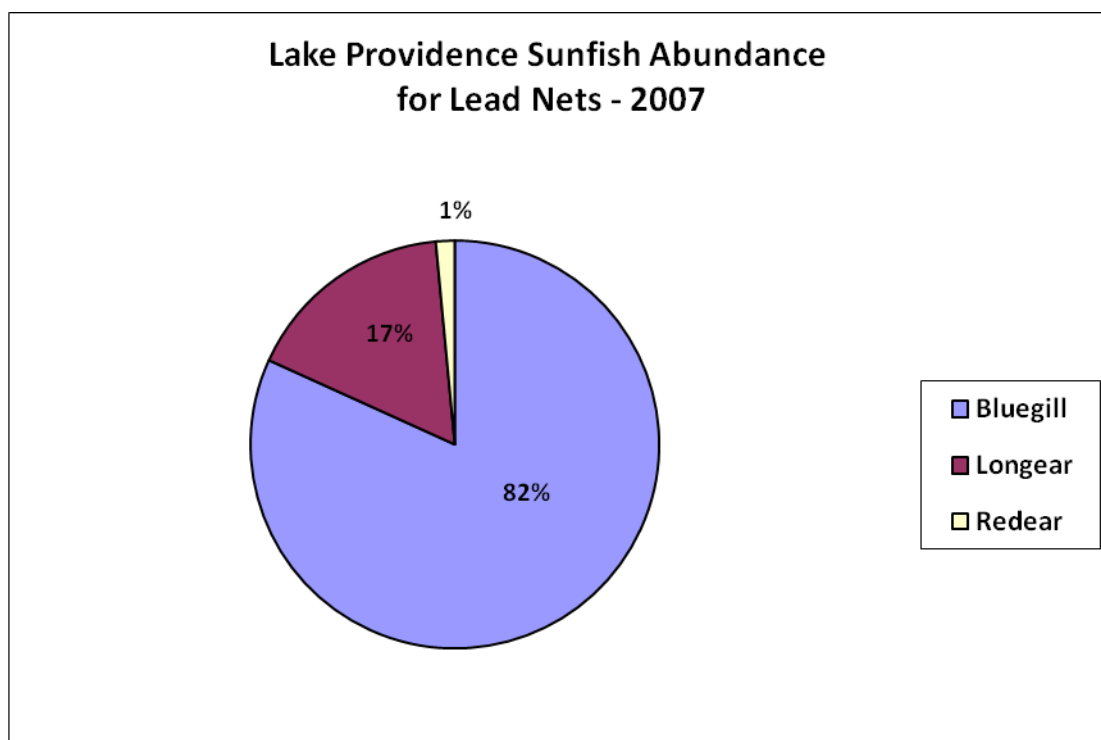


Figure 7. Percent relative abundance (by number) of the three most common species of sunfish captured in lead nets on Lake Providence, LA during 2007.

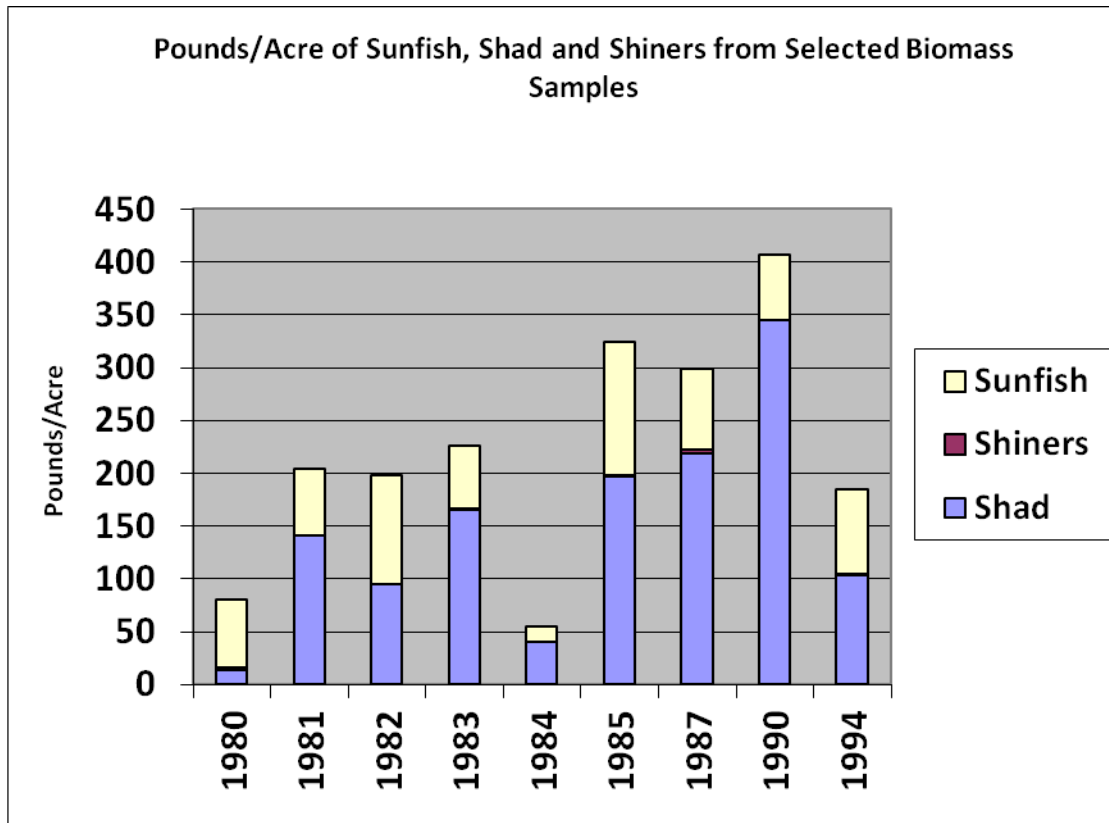


Figure 8. Biomass estimates (pounds per acre) of sunfish, shad, and shiners from Lake Providence, LA for 1980 - 1994.

### Channel Catfish-

Channel catfish (*Ictalurus punctatus*) are a significant fisheries resource of Lake Providence and have been a source of angler interest and concern. They have had a reputation of being abundant in the lake with average size being smaller than expected or desired by anglers. A special project was initiated in May 2004 in response to the most recent angler concern of a possibly stunted population. A total of 101 channel catfish were captured in wire traps and by angling to gather biological data on the population. Lengths and weights were recorded and fish were aged by counting annuli on thin sections of the pectoral spines. Figure 9 shows the size distribution in length groups of catfish collected in this sample. The mean total length (TL) of channel catfish in this sample was 12.5 inches. Assigning ages to pectoral thin sections proved to be difficult, with estimates varying from one to three years of age for many fish. Nearly all of the fish sampled were three to five years old, with the oldest being seven. There was a high variability in age among similar sized fish. For example, 11 inch TL catfish varied in age from two to six years. The mean age of a 12.5 inch TL catfish was 4.0 years. For comparison, age estimates for channel catfish from D'Arbonne Lake, Union Parish, showed that 12.5 inch TL fish were estimated to be 2.5 years old. Also, the mean lengths at age for all ages were less at Lake Providence than D'Arbonne Lake,

which is considered a less fertile upland reservoir. It appears that the population in Lake Providence may be stunted, possibly due to overcrowding, though the mean length of catfish from this study was higher than was determined from sampling conducted by LDWF in 1985 (9.6 in.) and 1994 (9.9 in.).

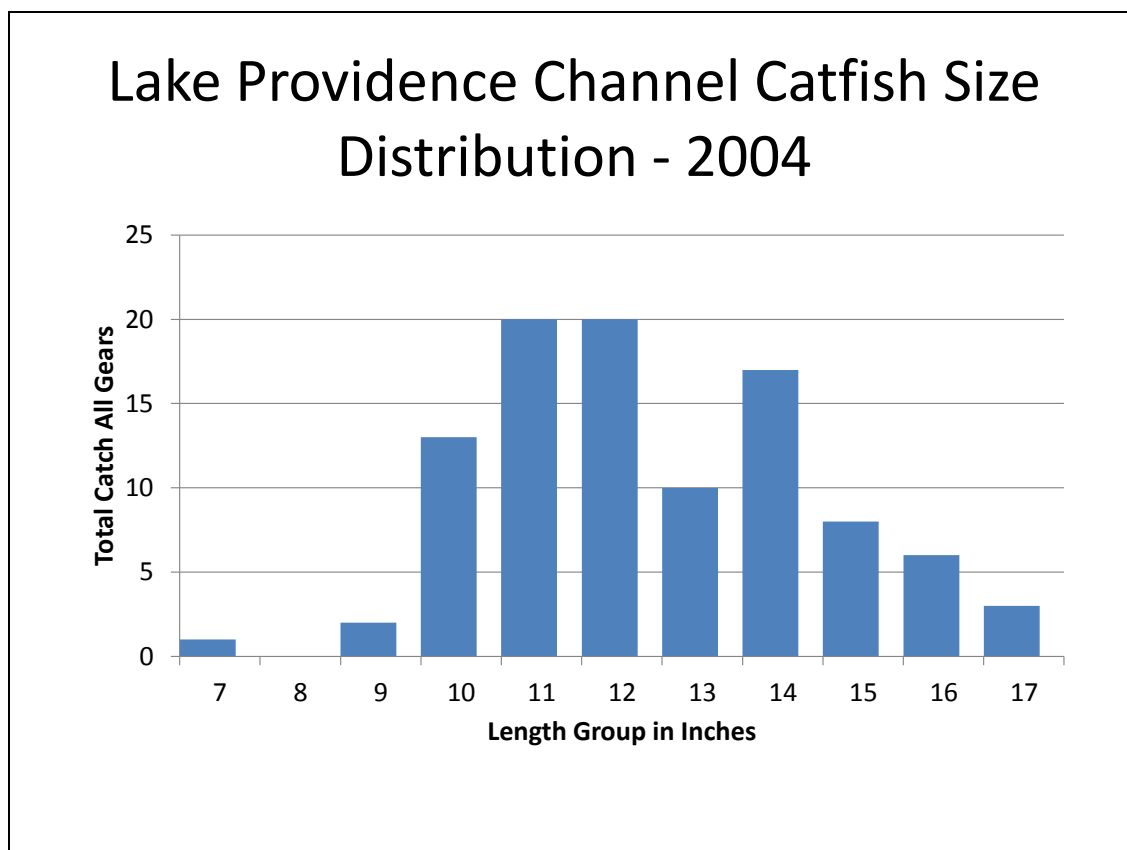


Figure 9. Size distribution in length groups (inches) of channel catfish collected May – June, 2004 on Lake Providence, LA from various sampling gears (n = 101).

### *Forage*

Sunfish (*Lepomis spp.*), yellow bass (*Morone mississippiensis*), brook silversides (*Labidesthes sicculus*), gizzard shad (*Dorosoma cepedianum*), threadfin shad (*Dorosoma petenense*), and cyprinid minnows (shiners) have been identified as the primary forage species in Lake Providence. In addition to measurement of forage availability indirectly from largemouth bass Wr's (described above), forage abundance has also been estimated from biomass (rotenone) sampling. Figure 8 (above) shows pounds per acre of shad, sunfish, and shiners obtained during the last nine biomass samples. The mean weight in pounds for shad and shiners respectively, are 145.8 lbs./acre and 1.2 lbs./acre.

## Commercial

Several commercial species have been documented in Lake Providence. Six of the most abundant commercial species collected from gill net samples are listed in Table 1 along with their respective CPUE's for 2001, 2006, and 2010. Bigmouth buffalo (*Ictiobus cyprinellus*), black buffalo (*I. niger*), and smallmouth buffalo (*I. bubalus*) are common in the lake. Channel catfish are the most common commercial species of catfish, though other species are present. They provide a significant fishery for both commercial and recreational anglers in Lake Providence. Table 2 reports the pounds per acre of these six species from the last three biomass (rotenone) samples.

Table 1. Catch per unit effort in number of fish captured per 100 feet of gill net per net night for selected commercial species on Lake Providence, LA for 2001, 2006, and 2010.

| Species  | 2001 | 2006 | 2010 | Mean |
|--|------|------|------|------|
| Buffalo (all species)                            | 1.02 | .17  | .03  | .41  |
| Bowfin ( <i>Amia calva</i> )                     | .01  | 0    | 0    | .01  |
| Common carp ( <i>Cyprinus carpio</i> )           | .04  | .02  | .53  | .20  |
| Channel catfish                                  | .13  | .13  | .33  | .20  |
| Spotted gar ( <i>Lepisosteus oculatus</i> )      | .01  | .01  | .03  | .02  |
| Freshwater drum ( <i>Aplodinotus grunniens</i> ) | .03  | .04  | .03  | .03  |

Table 2. Estimates of pounds per acre of selected commercial species captured in biomass samples from Lake Providence, LA for 1987, 1990, and 1994.

| Species               | 1987  | 1990  | 1994 | Mean  |
|-----------------------|-------|-------|------|-------|
| Buffalo (all species) | 2.43  | 5.62  | 0    | 4.0   |
| Bowfin                | 0     | .7    | 6.8  | 2.5   |
| Common carp           | 10.2  | 17.1  | 12.2 | 13.2  |
| Channel catfish       | 37.8  | 50.3  | 28.3 | 38.8  |
| Spotted gar           | 0     | .5    | 7.4  | 2.6   |
| Freshwater drum       | 194.1 | 117.2 | 24.8 | 112.0 |

### Total Standing Crop

Total fisheries standing crops have been estimated from numerous biomass samples in the past (Figure 10). Estimates have generally ranged from 200 to 600 total pounds per acre, with a mean of 400 lbs./ac. With the exception of 1984, there is an obvious trend in increasing total fish biomass from 1980 – 1990. This may be a result of the watershed restoration projects that were initiated in the late 1970's. These projects were previously discussed in Lake Providence MP-A. The most recent standing crop estimates indicate a productive and possibly recovering fishery.

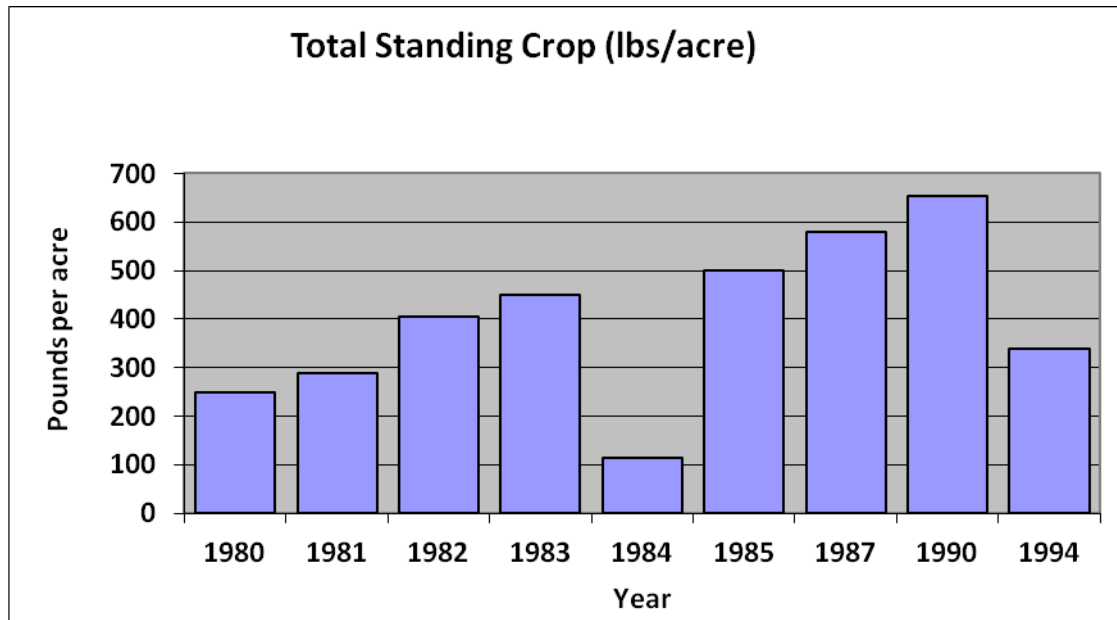


Figure 10. Standing crop estimates in pounds per acre of all fish species from Lake Providence, LA biomass (rotenone) sampling, from 1980 – 1994.

### Invasive Species

Grass carp (*Ctenopharyngodon idella*) have been present in Lake Providence since at least the mid 1990's. Silver carp (*Hypophthalmichthys molitrix*) were first reported to be present in the lake in 2011. Boaters and LDWF enforcement agents have reported large silver fish jumping throughout the lake. The presence of silver carp was confirmed in February 2012, when 11 adult fish were captured in a non-standardized gill net sample targeted for Asian carp. These fish are believed to have entered the lake during a high water period in spring 2011, where they could have crossed the weir at Tensas Bayou. This is most likely how the grass carp were introduced into the lake in the 1990's.

## **HABITAT EVALUATION**

### Aquatic Vegetation

Aquatic vegetation has not been abundant or problematic in Lake Providence in recent years. The natural planktonic shading has prevented excessive growth of submerged

vegetation, although as recently as the mid 1990's there was a moderate infestation of southern naiad (*Najas guadalupensis*) on the shallow flats on the southern end of the lake. Naiad is no longer found in any significant amount in the lake. Coontail (*Ceratophyllum demersum*) is present throughout the lake in the shallows, but not abundant in any particular area. There is a minimal amount of emergent and floating vegetation in the lake. Alligator weed (*Alternanthera philoxeroides*) and water hyacinth (*Eichhornia crassipes*) are the most common emergent and floating species in Lake Providence. Sea walls and wind action have prevented them from becoming abundant or problematic. They are mostly found in the bayous and ditches connected to the main lake.

#### Substrate

The substrate of Lake Providence is typical of the soils of the Mississippi alluvial valley. Silt loams and Sharkey clays are the most common soil types of the area. Though once a scoured channel of the Mississippi River, the lake bottom is now mostly covered with silt and fine clays from agricultural erosion. Residential areas surrounding the lake are now fully developed and improved agricultural practices have significantly reduced sedimentation into the lake.

#### Available complex cover

The most prominent forms of complex cover in Lake Providence are live bald cypress (*Taxodium distichum*) trees and residential piers. Cypress trees are abundant around much of the shoreline and in the shallow areas on each end of the lake. The roots and "knees" of these trees provide significant cover utilized by many species of fish. Residential piers have been constructed around much of the lake, with many extending into depths of at least 10 feet. Fish utilize the pier pilings and also the shade provided by them.

#### Artificial Structure

No artificial structure has been placed into Lake Providence by LDWF.

## **CONDITION IMBALANCE / PROBLEM**

The lack of an efficient water control structure capable of dewatering the lake at a rate greater than one inch per day is an obstacle to management of Lake Providence. Water to counter the effects of agricultural siltation and accumulation of organic material. Dewatering the shallow spawning areas while exposing them to air would accelerate the decomposition process and oxidize the organic layers, providing a more suitable spawning substrate for several fish species. A drawdown would also allow shoreline property owners an opportunity for maintenance on piers and seawalls. The recent infestation of Asian carp across the weirs during high water periods could potentially have a negative impact on the fishery. The continuous introduction of these fish each time the weirs are breached should be prevented.

## **CORRECTIVE ACTION NEEDED**

The current weirs and control structure should be redesigned. The control structure should be designed to release a sufficient amount of water that the lake level will fall at least one inch in a 24 hour period. The weirs should be designed in a way to prevent fish passage into the lake during routine high water periods.



## **RECOMMENDATIONS**

1. Meet with and explain the benefits of water level fluctuations as a management tool with the Lake Providence Lake Commission. Also explain the importance of water control structure and weir integrity.
2. Inform the commission of the threats that Asian carp may have on the lake, including boater safety and potential harm to the fisheries.
3. Continue standardized fish sampling as currently scheduled.
4. Monitor the recently introduced population of Asian carp by periodic sampling with experimental gill nets targeted at Asian carp, in addition to standardized gill net sampling.